United States
Department of
Agriculture

National
Agricultural
Statistics
Service

Research and
Applications
Division

NASS Staff Report
Number SRB-88-02

January 1988

A Commodity Weighted Estimator

Gretchen McClung

A COMMODITY WEIGHTED ESTIMATOR, by Gretchen McClung, Research and Applications Division, National Agricultural Statistics Service, U.S. Department of Agriculture, Washington, D.C. 20250, January 1988. Staff Report No. SRB-NERS-88-02.

ABSTRACT

The use of a commodity weighted estimator for the nonoverlap (NOL) portion of the multiple frame estimator from the December Agricultural Survey (DAS) was investigated. Estimates using a commodity-based weight were compared with those using the operational weight of tract acres/farm acres. The two methods produced comparable United States expansions and CVs (coefficients of variation) for crops, hogs, stocks, storage capacity, and number of farms. However, the land in farms commodity weighted estimate was significantly larger than the operational weighted estimate. As the commodity weighted estimator has several advantages over the operational weighted estimator, its use looks promising (except for land in farms). Analysis of June Agricultural Survey data should provide further recommendations.

ACKNOWLEDGMENTS

The author would like to thank Ron Bosecker for his valuable suggestions and continuing interest in this study, Brad Pafford for his comments on the paper and for sharing his computer programs for calculating the estimates and variances, and Jack Nealon for his thorough and helpful review of the paper. The data collection and processing efforts of NASS's state statistical offices staff in support of this research effort are also appreciated.

CONTENTS

Page

SUMMARY....3

INTRODUCTION....4

METHODS
The Study....5
Definition of the Commodity-Based Weight....5
Imputation....7

RESULTS
The Basis of the Weights....7
Imputation for the Two Commodity Weights....9
Comparison of Commodity Weight and Operational Weight....10
Estimates for 14 Commodities....12

CONCLUSIONS AND RECOMMENDATIONS....15

REFERENCES....17

APPENDIX A: FORMULAS FOR THE ESTIMATES OF TOTALS AND VARIANCES..18

APPENDIX B: SECTIONS OF THE QUESTIONNAIRE....21

APPENDIX C: FREQUENCIES FOR THE WEIGHT BASIS - BY STATE....23

APPENDIX D: STATISTICAL TESTS....27

APPENDIX E: COMMODITY ESTIMATES AND CVs BY STATE....28

SUMMARY

The use of a commodity weighted estimator for the nonoverlap(NOL) portion of the Quarterly Agricultural Survey (QAS) was investigated using data from the December QAS. The commodity-based weight is the ratio of tract amount of a commodity to farm amount of that commodity. The commodity used for the weight follows the hierarchy of crop of greatest acreage, pasture acreage, number of hogs, number of cattle, number of sheep, grain storage capacity, and the default of percent of agricultural income derived from within the tract. Another commodity weight that did not use pasture as a basis for weighting was investigated and rejected as inferior to the commodity weight just described. The operational weight is the ratio of tract acres to farm acres.

The commodity weighted estimator has several advantages over the operational weighted estimator. Tracts with zero weights do not have to be contacted if subsampled in later quarters since the weights will be 'frozen'. Also, city segments do not have to be screened because any farmers located there will have commodity weights of zero (since the tract amount of any commodity will be zero). However, the commodity weighted estimator seems to have an upward bias as does the operational weighted estimator.

U.S. expansions and CVs for crops, hogs, stocks, grain storage capacity, and number of farms were not significantly different for the commodity weighted and operational weighted estimators. The commodity weighted estimator did not, however, produce a comparable estimate to the operational weighted estimate for land in farms. The commodity weighted land in farms estimate was significantly larger than the operational weighted estimate (which reduces to the tract estimate for land in farms). The reason for this difference in levels is not known.

The commodity weighted estimator is not recommended for use in estimating land in farms, but its use for other commodities looks promising. If the commodity weight was used operationally, it would be obtained in June and frozen for use in the remaining quarters. The method by which the commodity weight is determined differs between the December and June surveys. Therefore, further analysis using June data is necessary before final conclusions can be drawn. Analysis of 1987 June QAS data is now underway and should provide more answers on the potential use of the commodity weighted estimator.

INTRODUCTION

The December Agricultural Survey (DAS) is a multiple frame (area + list) survey conducted by the National Agricultural Statistics Service (NASS). The area tracts that are nonoverlap (NOL) with the Quarterly Agricultural Survey (QAS) list are used to calculate the area frame contribution to the estimates. A weighted estimator is used for the NOL portion of the estimates for crops, stocks, and hogs. This estimator weights each tract by the ratio of tract acres to farm acres. There is much documentation on the problems associated with the operational weighted estimator. The advantages and disadvantages of it have been well documented by Jack Nealon (4). One disadvantage of the operational weight is the problem of coverage errors, such as undercounting operations in residential or city segments. The biggest disadvantage of the operational weighted estimator is its upward bias, which is due to underreporting of total farm acres.

There have been several attempts to find an improved weighted estimator. In 1981, Nealon (3) investigated two weights, one based on acres minus woods and waste, and the other based on cropland. The cropland weight seemed to be the more promising of the two. Later, Dillard and Nealon (2) reported that the cropland weighted estimator did not seem to be biased. However, it was undefined when there was no cropland on the farm.

Another weighted estimator has been proposed by Bethel (1). His approach was to weight the data based on a hierarchy of commodities found on the farm. He defined this greatest commodity weight as

$$\frac{\text{tract acreage of crop of greatest acreage}}{\text{farm acreage of crop of greatest acreage}}, \text{ if denominator} > 0$$

$$\frac{\text{number of hogs on tract of farm}}{\text{number of hogs on the farm}}, \text{ if no crops and number of hogs on farm} > 0$$

$$\frac{\text{number of cattle on tract of farm}}{\text{number of cattle on the farm}}, \text{ if no crops, no hogs, and number of cattle on farm} > 0$$

$$\text{RFO estimate} = \begin{cases} 1 & \text{if resident farm operator} \\ 0 & \text{if nonresident} \end{cases}, \text{ otherwise.}$$

The major appeal of this weighting scheme was that the weight was based on the tract and farm values of the operator's 'major' commodity and not on total tract and farm acres. The hope was that by using information for the 'major' activity, and not total acres, there would be less misreporting. After investigation of this weight for several commodities in three states in the 1984 June

Enumerative Survey (JES), Bethel concluded that the greatest commodity weighted estimator appeared to be a promising replacement for the operational weighted estimator, but more research was needed.

Pafford (5) investigated the use of the greatest acreage estimator for PIGA (Public, Industrial, and Grazing Association) cattle in Arizona for the 1985 JES. He reported some problems with its use, and suggested that a modification of the weight would make it more suitable for use in the Western States.

This paper reports findings from research on the use of this estimator for the December Agricultural Survey.

METHODS

The Study

This study was conducted on the 1986 December Agricultural Survey (DAS). Tracts sampled for the June Enumerative Survey (JES) are subsampled in December. All 48 states in the DAS were included so that U.S. totals could be obtained and inferences would not have to be made for states not in the study. Estimates were generated for the nonoverlap (NOL) portion of the multiple frame estimator that is currently in use. Twelve commodities, including hogs, crops, and stocks, were estimated, along with number of farms and land in farms. Formulas for the NOL expansions and their variances are in Appendix A. In this study, the definition of the commodity weighted estimator was expanded somewhat from Bethel's definition. Commodity weighted estimates were compared with the operational weighted estimates at the state and national levels. For number of farms and land in farms, comparisons were also made with the open, or Resident Farm Operator (RFO), estimate.

Definition of the Commodity-Based Weight

The crop with the greatest acreage on the farm is still the first basis for weighting. It was not known if pasture would be an appropriate basis on which to weight the data, so it was decided that two commodity-based weights, one using pasture and one not, would be generated and compared.

notation:

c_f = farm acreage of crop with greatest acreage on farm f

c_{hif} = tract acreage, for tract hi, of crop with greatest acreage on farm f

p_f = pasture acreage on farm f

p_{hif} = pasture acreage on tract hi of farm f

h_f = number of hogs on farm f

h_{hif} = number of hogs on tract hi of farm f

t_f = number of cattle on farm f

t_{hif} = number of cattle on tract hi of farm f

s_f = number of sheep on farm f

s_{hif} = number of sheep on tract hi of farm f

g_f = grain storage capacity on farm f

g_{hif} = grain storage capacity on tract hi of farm f

a_f = amount of agricultural income in 1986 for farm f

a_{hif} = amount of agricultural income in 1986 derived from tract hi of farm f

For the weight calculated with pasture as a potential weighting factor, which will be referred to as commodity weight 1, the weight is calculated as:

$$w_{hi} = \begin{cases} c_{hif}/c_f & \text{if } c_f > 0 \\ p_{hif}/p_f & \text{if } c_f = 0,\ p_f > 0 \\ h_{hif}/h_f & \text{if } c_f = 0,\ p_f = 0,\ h_f > 0 \\ t_{hif}/t_f & \text{if } c_f = 0,\ p_f = 0,\ h_f = 0,\ t_f > 0 \\ s_{hif}/s_f & \text{if } c_f = 0,\ p_f = 0,\ h_f = 0,\ t_f = 0,\ s_f > 0 \\ g_{hif}/g_f & \text{if } c_f = 0,\ p_f = 0,\ h_f = 0,\ t_f = 0,\ s_f = 0,\ g_f > 0 \\ a_{hif}/a_f & \text{if } c_f = 0,\ p_f = 0,\ h_f = 0,\ t_f = 0,\ s_f = 0,\ g_f = 0,\ a_f > 0 \end{cases}$$

The weight calculated without pasture as a potential weighting factor, which will be referred to as commodity weight 2, is the same as the above w_{hi} except there is no p_f or p_{hif}.

Since most of this information is not usually collected in the December surveys, additional questions were needed. These were

added to the Crop Supplement portion of the questionnaire (Sections 3-A and 7). Appendix B shows the actual questions used. In the actual calculation of the weight, the first part of question 4 was ignored. If the basis of the weight defaulted to agricultural income, agricultural income was used to calculate or impute a weight even if total income was less than $1,000.

Imputation

The data sets used for the analysis had been through the operational imputation procedure, which imputes values for crops, farm pasture, stocks, and total storage capacity if they are missing (6). Some of these imputed values were used to determine a commodity weight. These cases were not differentiated from those where all the information needed was reported. Imputation of a commodity weight was necessary only when information was missing from sections 3-A or 7 of the crop supplement questionnaire. Weights were imputed based on the average reported weight within state, weight basis, crop reporting district, and land use stratum (agricultural or nonagricultural). At least two weights were needed at a particular level in order to calculate a mean to impute. If the basis for the weight could not be determined, a state average of the reported weights was imputed.

RESULTS

The Basis of the Weights

In determining the commodity-based weight, it was expected that the majority of farmers grows at least one crop, so that only one question would need to be asked in order to determine the weight. Table 1 shows that for all 48 states in the survey, 68.1% of the tracts had some type of crop grown on the associated farm. When pasture is the second priority for the weight (commodity weight 1), 22.1% of the remaining tracts used pasture as the basis for the weight. Therefore, just asking two more questions provided the commodity weight for 90.3% of the tracts at the U.S. level. At the state level, crops and pasture provided a weight for over 85% of the tracts in all but six states (AZ, DE, MA, MN, MS, RI). State level tables are provided in Appendix C.

TABLE 1: Frequencies of the Basis of Commodity Weight 1

Basis for weight	Number of tracts	Percent	Cumulative # of tracts	Cumulative percent
Crop of greatest acreage	10,826	68.1	10,826	68.1
Pasture	3,515	22.1	14,341	90.3
Hogs	271	1.7	14,612	92.0
Cattle	228	1.4	14,840	93.4
Sheep	39	0.2	14,879	93.7
Grain capacity	159	1.0	15,038	94.7
Ag income	822	5.2	15,860	99.8
No basis[1]	26	0.2	15,886	100.0

[1] This refers to tracts where the questionnaire was incomplete or was not completed correctly so that neither a weight nor the basis for the weight could be determined (imputation was based on the state mean of all reported weights).

As seen in Table 2, when pasture is not used as a weighting basis (commodity weight 2), the second priority, hogs, accounts for only 3.5% of the tracts. Questions on hogs, cattle, sheep, and grain capacity were all necessary before 89.9% of the tracts obtained a commodity-based weight.

It is evident that including pasture as the second priority for the determination of the weight can eliminate one or more additional questions for the respondent. This would keep additional respondent burden to a minimum.

TABLE 2: Frequencies of the Basis of Commodity Weight 2

Basis for weight	Number of tracts	Percent	Cumulative # of tracts	Cumulative percent
Crop of greatest acreage	10,826	68.1	10,826	68.1
Hogs	556	3.5	11,382	71.6
Cattle	2,415	15.2	13,797	86.9
Sheep	232	1.5	14,029	88.3
Grain capacity	250	1.6	14,279	89.9
Ag income	1,422	9.0	15,701	98.8
No basis[1]	185	1.2	15,886	100.0

[1] see footnote for Table 1.

Also of interest is the number of zero weights obtained when the weight is commodity based. The operational weight of tract

acres/farm acres will of course never be zero, but a certain percentage of the commodity based weights are zero. Table 3 shows the breakdown of zero weights by weight basis for both commodity weights. We observe that for commodity weight 1, there were 3,248 weights of zero, accounting for 20.4% of the total tracts. There was an increase in the number of zero weights when pasture was not used for weighting. For commodity weight 2, a total of 3,420 weights were zero, which accounts for 21.5% of the tracts.

TABLE 3: Frequencies of the Basis of the Weight -- Showing Breakdown of Zero Weights

Basis for weight	Positive or zero weight	Commodity weight 1		Commodity weight 2 [1]	
		Number of tracts	Percent of total	Number of tracts	Percent of total
Crop of greatest acreage	+	8,013	50.4	8,013	50.4
	0	2,813	17.7	2,813	17.7
Pasture	+	3,255	20.5	-	-
	0	260	1.6	-	-
Hog	+	255	1.6	498	3.1
	0	16	0.1	58	0.4
Cattle	+	192	1.2	2,088	13.1
	0	36	0.2	327	2.1
Sheep	+	31	0.2	183	1.2
	0	8	0.1	49	0.3
Grain capacity	+	92	0.6	149	0.9
	0	67	0.4	101	0.6
Ag income	+	774	4.9	1,350	8.5
	0	48	0.3	72	0.5
No basis	+	26	0.2	185	1.2
Total	+	12,638	79.6	12,466	78.5
	0	3,248	20.4	3,420	21.5

[1] Commodity weight 1 - weight using pasture as the second priority for the basis.
Commodity weight 2 - does not use pasture as a basis for the weight.

Imputation for the Two Commodity Weights

Imputation of a commodity weight was necessary in some cases due to incomplete reports, misunderstanding of the questions, etc. For commodity weight 1, imputation of a weight was necessary in 2,164 cases, or 13.6% of the tracts. Imputation rates ranged from 3.6% (New Hampshire) to 35.8% (Delaware). All states (except three) had more imputation of commodity weight 2. A total of 2,793 tracts (17.6%) had commodity weight 2 imputed. The range here was from

5.3% in Connecticut to 35.8% in Delaware. This increased rate of imputation is to be expected since more commodity weight related questions needed to be asked in many cases for weight 2, so there was a greater potential for difficulties in obtaining the weight.

Expansions generated by the two commodity weighted estimators were compared outside of this paper and were found to be similar or the same for hogs, crops, stocks, and number of farms. For land in farms, the commodity weight using pasture produced a lower estimate than the weight that did not include pasture. Therefore, only commodity weight 1 will be presented in the remainder of this paper since it was easier to obtain, less imputation was necessary, and the results were so similar.

Comparison of Commodity Weight and Operational Weight

The distribution of the weights obtained by the operational procedure and the commodity-based procedure were compared. Figures 1 and 2 show the distribution of the actual weights for the 15886 NOL tracts for the operational weight and the commodity weight, respectively.

It is evident from the two figures that there are more weights at the two extremes for the commodity-based weight than the operational weight. The two end intervals account for about 68% of the commodity weights but only about 58% of the operational weights. More weights in the interval [0,.1) are expected for the commodity weight because it can be equal to zero and the operational weight cannot. There are also more commodity weights in the [.9,1] interval. Of the 6,875 weights in this interval, there are 6,702 equal to 1. Of the 6,495 operational weights in this interval, only 5,583 of them are equal to 1. This is expected since the commodity weight can be equal to one more often than the operational weight can. When the operational weight is one, the commodity weight must also be one, but the reverse is not true. There are cases where farm acres are greater than tract acres but the commodity-based weight uses a commodity that is found only in the tract.

The two weights were also compared for the 2164 tracts that had imputed commodity weights. The mean operational weight for these tracts was .63, as compared to a mean of .53 for the commodity weight. The operational weight was larger than the commodity weight for 1199 (55.4%) of the tracts and smaller for 844 (39.0%) of the tracts.

Figure 1: Frequency Chart for Operational Weight

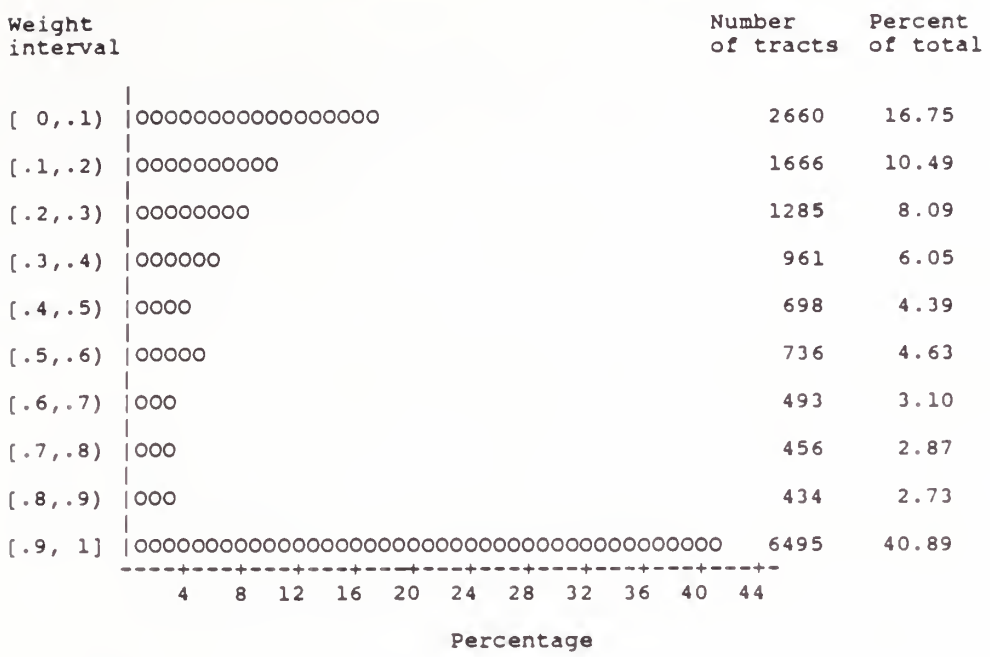
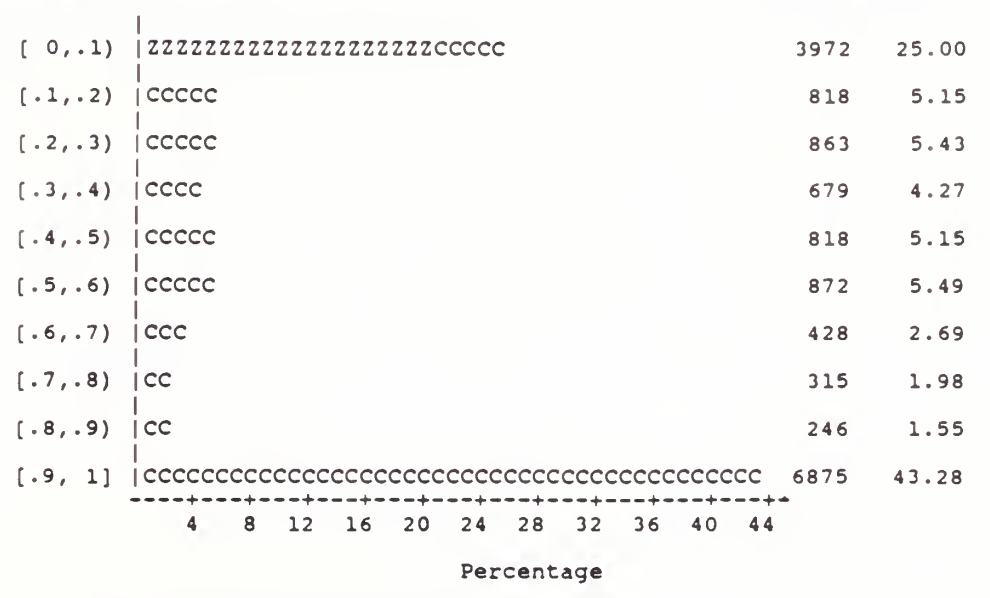


Figure 2: Frequency Chart for Commodity Weight



Z = commodity weight of 0
C = commodity weight > 0

Estimates for 14 Commodities

Table 4 contains the U.S. NOL estimates for hogs, three major crops, and three minor crops, and Table 5 contains the estimates for stocks and storage capacity. These tables show that the commodity weighted and operational weighted expansions and CVs (coefficents of variation) are very similar. The relative differences range from -2.4% to 9.9%. None of the differences in levels are statistically significant at the .05 level. The statistical test used is described in Appendix D. Corn acres harvested had the lowest significance level (.08) even though the relative difference was not large.

The only noticeable difference observed is for sorghum. Sorghum acres harvested has the largest relative difference and the largest difference in the CVs for the two estimation methods. Looking at the state level estimates for sorghum acres harvested (Appendix E, Table 6), it is clear that this difference can be largely attributed to Kansas. Kansas has the greatest number of acres of sorghum harvested, and the CVs for the two estimates are noticeably different. A closer investigation of the data at the tract level revealed that the differences in levels and CVs in Kansas are due mainly to just two tracts that have large expansion factors combined with commodity-based weights that are much larger than the corresponding operational weights. It is of interest to note that of these two tracts, one had an imputed commodity weight and one did not. These two tracts did not, however, cause a significant difference in the levels for Kansas or the U.S.

State level tables for the other commodities can also be found in Appendix E. At the State level, some differences between the commodity weighted and operational weighted expansions are statistically significant. The results at the state level show more fluctuation than at the U.S. level, although no pattern emerges.

TABLE 4: U.S. NOL Expansions and CVs for Hogs and Crops

Commodity	Commodity weighted expansion	CV %	Operational weighted expansion	CV %	Relative dif. 1/ %	Sig. level
Total hogs	9,087,178	7.0	8,897,658	7.6	2.1	.64
Corn acres harvested	15,501,878	3.3	15,059,595	3.6	2.9	.08
Soybean acres harvested	12,966,233	4.6	12,458,095	4.6	4.1	.18
Winter wheat acres harvested	8,563,363	4.8	8,531,929	4.8	.4	.88
Oat acres harvested	519,147	8.0	510,060	7.6	1.8	.67
Sorghum acres harvested	3,174,216	14.1	2,888,520	6.9	9.9	.42
Rye seedings	619,399	7.1	613,963	9.2	.9	.91

1/ Relative difference =

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

TABLE 5: U.S. NOL Expansions and CVs for Stocks and Capacity

Commodity	Commodity weighted expansion (1000)	CV %	Operational weighted expansion (1000)	CV %	Relative dif. 1/ %	Sig. level
Corn stocks	994,579	4.0	992,481	3.9	.2	.89
Soybeans stocks	194,902	5.4	188,104	4.5	3.6	.37
All wheat stocks	156,812	6.5	160,644	7.1	-2.4	.57
Hay stocks	41,195	4.5	42,197	4.3	-2.4	.29
Grain storage capacity	2,198,192	3.3	2,200,609	3.6	-.1	.96

1/ Relative difference =

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

U.S. estimates for number of farms are shown in Table 6. The results are comparable to those for crops and stocks. For the two weighted estimators, the CVs are the same and the expansions have a relative difference of only .5%. The difference in the expansions is not significant. At the state level, half of the commodity weighted expansions are above the operational weighted expansion and half are below. The relative differences range from -37.6% to 35.0%, with some negative and some positive differences being statistically significant. The state level estimates are in Table 13 of Appendix E. For the U.S., the weighted expansions are both about 20% higher than the RFO expansion. The RFO expansion is known to have a problem of undercoverage (4). Therefore, this result was expected. However, the weighted expansions may be too much higher than the RFO expansion (due to the upward bias).

The commodity weighted estimate for land in farms does not follow the pattern of the other commodity weighted estimates. Although their CVs are close, the commodity weighted and operational weighted expansions have a relative difference of 34.7% (see Table 6). This difference is strongly significant (level is <.01). At the state level (see Table 14 of Appendix E), the relative differences range from -71.8% to 169.2%, with the majority of the differences statistically significant. The reason for the difference in the levels of the two estimates is not clear. It is possible that the Western States in particular may be a major contributing factor. There may be a problem in the reporting of farm acres, with public (PIGA) land being included although it should not be. Also, the 11 Western States as a group used the pasture-based weight more often than the other 37 states (27.16% as opposed to 20.52%). If there is more problem in reporting pasture than in reporting the other commodities, this may account for the large differences found for land in farms in the Western States. The five states with the largest relative differences are all Western States (OR, WY, CO, WA, CA). When the 11 Western States are deleted and a 37-state estimate of land in farms is generated, the relative difference between the commodity and operational weighted estimates drops to 24.4%. The significance level for this difference is still quite low (<.01).

For land in farms, the operational estimator is equal to the tract estimator. When estimating all other commodities, the weighted estimators take a weight between zero and 1, which is multiplied times the farm amount of each commodity. But for land in farms, the operational weighted estimator reduces to the tract estimator, while the commodity weighted estimator multiplies the commodity weight times farm acres. When the very same weights produce reasonable estimates of number of farms and harvested acres but significantly higher amounts of land in farms, then it appears that the problem lies with reported total farm acres. This, however, implies overreporting of total farm acres, which is contradictory to previous studies which indicate that total farm acres are underreported (4). If pasture weights are too large, and therefore the source of the problem, then a commodity weighted estimator that

did not use pasture as a basis should produce a lower estimate. But this did not occur, as previously stated on page 10. Two courses of action are possible:

1) Further research to identify the source of the reporting problem,

or

2) Ignore the weighted land in farm indication and continue to rely on the more precise tract estimator.

The RFO expansion has a larger CV than that of the other two expansions. This is expected as the RFO (open) estimate is known to be less precise than the closed (tract) estimate (4). The relative difference between the commodity weighted estimate and the RFO estimate is 43.4% for the U.S., with a range of -60.1% to 303.7% at the state level (see Appendix E, Table 14). If the 11 Western States are deleted, the relative difference between the commodity weighted and the RFO estimates for the remaining 37 states drops to 31.8%.

TABLE 6: U.S. Number of Farms and Land in Farms (NOL)

	Commodity weighted expansion	CV %	Operation weighted expansion	CV %	Rel dif.1/ %	Sig. level	RFO expansion	CV %	Rel dif.2/ %
Number of farms	1,249,564	1.7	1,242,929	1.7	.5	.25	1,039,802	1.9	20.2
Land in farms	396,785,195	3.7	294,523,943	3.2	34.7	<.01*	276,765,364	5.6	43.4

1/ Relative difference 1=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

2/ Relative difference 2=

$$100 * \frac{\text{(commodity wtd. expansion - RFO expansion)}}{\text{RFO expansion}}$$

* denotes a difference significant at alpha=.05.

CONCLUSIONS AND RECOMMENDATIONS

The levels of the estimates generated from this study indicate that the commodity weighted estimator, like the operational weighted estimator, is not free from an upward bias. This is in contrast to the original study which indicated that the commodity weighted estimator avoided the upward bias of the operational weighted estimator. There are several possible reasons for this difference in results. They are related to the differences between the December and June surveys. This study was conducted for the December QAS, whereas Bethel's study used data from the June Enumerative Survey. The values used to obtain a commodity weight

for Bethel's study were all obtained operationally. For the current study, additional questions were asked in order to obtain the commodity weight values. Computer edit checks for these questions were not as rigorous as those for the operational questions, so there may have been more nonsampling errors. A difference in the method of obtaining the tract values for the commodity weight may also have had an impact on the results. In June, crop and pasture tract acres are obtained by summing the values obtained at the field level. Waste in these fields has been accounted for separately. In December, however, the tract amount of the greatest acreage crop or pasture was obtained as a single value. Therefore, it is possible that the tract value is inflated (because waste may be included). This would cause the commodity weight to be larger, and hence the commodity weighted expansion to be biased upwards.

The commodity weight does have some advantages over the operational weight. Coverage errors are a problem with the operational weight. In highly populated areas, farm operators must still be located and their farm data weighted by the ratio of tract acres to farm acres. This screening process is time consuming and expensive. With the commodity weight, this prescreening is not needed because farmers in city segments would have weights of zero (since the tract amount of any commodity would be zero). This is a distinct advantage.

The June area frame sample is now the sample base for all remaining quarters. The samples for the off quarters are subsamples of the June sample. The weight for the tract will be obtained in June and "frozen" for use in the following quarters if the tract is sampled again. This means that a farmer whose tract has a commodity weight of zero (obtained in June) will not need to be interviewed again if the tract is sampled in a later quarter since the weight is frozen at zero. As 20.4% of the NOL tracts in the 1986 DAS had commodity weights of zero, this would represent a large savings of time and money. This advantage would counteract one disadvantage that the commodity weight has, namely, the need to ask a few more questions to obtain a weight.

The present study shows that the commodity weighted estimator has several advantages over the operational weighted estimator. The results also show that the commodity weighted estimator seems to have the same upward bias that plagues the operational weighted estimator. But as discussed above, there are several reasons why the results of this study should not be the only basis for a decision on the operational use of the commodity weighted estimator. If this weight is used operationally, it will be obtained in June (not in December) and will then be used for the remaining quarters of the QAS. Because of the differences between quarters, further research using data from June is essential. This research is now underway using June 1987 QAS data from fourteen States (including 8 Western States). Analysis of June data should provide more answers on the potential use of this estimator.

REFERENCES

(1) Bethel, James. A New Approach to Weighted Area Frame Estimates. U.S. Department of Agriculture, Statistical Reporting Service. 1985.

(2) Dillard, Dave and Jack Nealon. Comparison of the Operational and Cropland Weighted Estimators. U.S. Department of Agriculture, Statistical Reporting Service. 1983.

(3) Nealon, Jack. An Evaluation of Alternative Weights for a Weighted Estimator. U.S. Department of Agriculture, Statistical Reporting Service. 1981.

(4) _____. Review of the Multiple and Area Frame Estimators. U.S. Department of Agriculture, Statistical Reporting Service. 1984.

(5) Pafford, Brad. A Comparison of the Part A and Part C Procedures. U.S. Department of Agriculture, Statistical Reporting Service. 1986.

(6) U.S. Department of Agriculture, National Agricultural Statistics Service. December Supervising and Editing Manual. Section 11.9. October 1986.

APPENDIX A: FORMULAS FOR THE ESTIMATES OF TOTALS AND VARIANCES

The sample estimate of the total for a state is defined as follows:

$$\hat{Y}_{state} = \sum_{h=1}^{L} \hat{Y}_h = \sum_{h=1}^{L} \sum_{i=1}^{t_h} e_{hi} \hat{Y}'_{hi}$$

$$= \sum_{h=1}^{L} \sum_{i=1}^{t_h} e_{hi} n_{hi} w_{hi} z_{hi}$$

L = number of summary strata in the state

t_h = number of tracts in summary stratum h

e_{hi} = DAS expansion factor for tract i in summary stratum h
= inverse of DAS sampling rate * inverse of JES sampling rate

n_{hi} = nonoverlap (NOL) indication for tract i in summary stratum h
= 1 if tract is NOL with list,
= 0 if tract is OL with list

w_{hi} = weight for tract i in summary stratum h

= 1 if RFO, 0 otherwise, for the RFO (open) estimate

= $\frac{\text{tract acres}}{\text{farm acres}}$ for the operational weighted estimate

= w_{hi} as defined on pages 5 and 6 for the commodity weighted estimate

z_{hi} = entire farm value of the commodity of interest for tract i in summary stratum h

The variance of the estimated total is defined as follows:

$$\text{var}(\hat{Y}_{state}) = \text{var}_1(\hat{Y}) + \text{var}_2(\hat{Y})$$

where

$\hat{var}_1(\hat{Y})$ = between tract within summary stratum component of the variance

$$\hat{var}_1(\hat{Y}) = \sum_{h=1}^{L} \hat{var}_1(\hat{Y}_h)$$

$$\hat{var}_1(\hat{Y}_h) = \frac{t_h - v_h}{t_h} \frac{v_h}{v_h - 1} \sum_{i=1}^{t_h} (e_{hi}\hat{Y}'_{hi} - \hat{\bar{Y}}'_{h.})^2$$

where

$$t_h = \sum_{j=1}^{r_h} t_{jh} = \text{number of JES tracts in summary stratum h}$$

r_h = number of segments in summary stratum h

t_{jh} = number of JES tracts in segment j in summary stratum h

v_h = number of DAS tracts in summary stratum h

$$\hat{\bar{Y}}'_{h.} = \sum_{i=1}^{t_h} e_{hi} \hat{Y}'_{hi} / v_h$$

and

$\hat{var}_2(\hat{Y})$ = between segment within substratum component of the variance due to the subsampling design in the DAS

$$\hat{var}_2(\hat{Y}) = \sum_{m=1}^{s} \sum_{k=1}^{p_m} \hat{var}_2(\hat{Y}_{km})$$

s = number of land use strata in the state

p_m = number of substrata within land use stratum m

$$\hat{var}_2(\hat{Y}_{km}) = \frac{R_{km} - r_{km}}{R_{km}} \frac{r_{km}}{r_{km} - 1} \sum_{j=1}^{r_{km}} (\hat{X}_{kmj} - \hat{\bar{X}}_{km.})^2$$

r_{km} = number of JES segments in substratum k, within land use stratum m

$$R_{km} = \sum_{j=1}^{r_{km}} e_{kmj} = \text{expanded number of segments in substratum k, within land use stratum m}$$

$$\hat{X}_{kmj} = e_{kmj}\, T_{kmj} = e_{kmj} \sum_{h=1}^{L} t_{hkmj}\, \hat{\bar{Y}}_h$$

where e_{kmj}= JES expansion factor for segment j, within substratum k, within land use stratum m

t_{hkmj}= number of JES tracts in segment j, within substratum k, within land use stratum m, and summary stratum h

$$\hat{\bar{Y}}_h = \hat{Y}_h \Big/ \sum_{i=1}^{t_h} e_{hi} = \text{weighted stratum mean for summary stratum h}$$

$$\hat{\bar{X}}_{km.} = \sum_{j=1}^{r_{km}} \frac{\hat{X}_{kmj}}{r_{km}}$$

The variance formula used in this study differs from that used in the operational summary system. An error has been found in the summary system's calculation of $\text{var}_1(\hat{Y}_h)$. Therefore, the CVs (coefficients of variation) for the operational weighted expansions found in this paper will not be the same as those calculated by the operational summary system for this survey.

SECTION 3-A — LARGEST CROP ACREAGE

1. Were there any crops, including hay, reported in Section 3 of this Supplement?

☐ NO ☐ YES

1(a). **ENUM. NOTE:** Copy the acres of the crop, including hay, with the greatest planted acreage from **SECTION 3.**

CROP _____ ..... 106 . __ ac

1(b). How many acres of this *(Item 1)* crop were planted inside these **TRACT** Boundaries ..... 107 . __ ac.

Go to Section 5 (Grain Stocks)

ENUM. NOTE: Ask Item 2 only if pasture was reported in Section 3.

2. How many acres of **pasture** reported for the entire farm are inside the **TRACT** boundaries? ..... 109 . __ ac.

SECTION 7 — FARM CLASSIFICATION

NOTE: If crops or hogs were reported, conclude interview.

1. **ENUM. NOTE:** Was cattle reported in Section H, Page 10 for the **ENTIRE FARM**?

☐ **NO** ☐ **YES** → *Conclude Interview.*

1(a). How many cattle and calves, regardless of ownership, are on the total acres operated *(include cattle on PIGA land)*..... 841

NOTE: If cattle reported, conclude interview.

2. **ENUM. NOTE:** If sheep were reported for the operator (column A) in Section L, Page 16, skip to Item 2(b).

2(a) How many sheep and lambs, regardless of ownership are on the total acres you operate *(include sheep located on PIGA land)*?.... 842

2(b) Of the *(total)* sheep and lambs:

How many are inside the **TRACT** boundaries?..... 844

NOTE: If sheep were reported, conclude interview.

3. Was grain storage capacity reported in Section 3, of this supplement, for the **ENTIRE FARM**?

☐ **NO** ☐ **YES**

3(a) Of the total capacity, how much is located inside the **TRACT** Boundaries?..... 850

NOTE: If capacity was reported, conclude interview.

4. Did this operation have more than $1,000 of agricultural income in 1986 *(including government farm program payments)*?

☐ **YES = 1**

☐ **NO = 2**

..... **Enter Code** 907

NOTE: Ask if more than $1,000 reported.

4(a) What percentage of the total agricultural production income was derived from within the **TRACT** Boundaries? *(including government program payments)*?..... 908 %

RESPONSE	
3-INT 8-IR 9-Inac	139

Enumerator _____ Date _____

APPENDIX C: FREQUENCIES FOR THE WEIGHT BASIS - BY STATE

State	Basis for weight: Crop	Pasture	Hog	Cattle	Sheep	Grain Cap.	Ag Income	No Basis	Total tracts
AL	229	137	13	2	0	2	35	0	418
	54.78	32.78	3.11	0.48	0.00	0.48	8.37	0.00	
AZ	164	65	12	31	3	4	55	0	334
	49.10	19.46	3.59	9.28	0.90	1.20	16.47	0.00	
AR	233	87	5	5	0	0	10	2	342
	68.13	25.44	1.46	1.46	0.00	0.00	2.92	0.58	
CA	620	223	10	19	7	2	53	1	935
	66.31	23.85	1.07	2.03	0.75	0.21	5.67	0.11	
CO	195	91	1	11	2	9	10	1	320
	60.94	28.44	0.31	3.44	0.63	2.81	3.13	0.31	
CT	29	5	0	0	0	0	4	0	38
	76.32	13.16	0.00	0.00	0.00	0.00	10.53	0.00	
DE	51	2	3	2	0	1	6	2	67
	76.12	2.99	4.48	2.99	0.00	1.49	8.96	2.99	
FL	250	195	14	9	0	0	48	0	516
	48.45	37.79	2.71	1.74	0.00	0.00	9.30	0.00	
GA	198	81	9	5	0	2	14	1	310
	63.87	26.13	2.90	1.61	0.00	0.65	4.52	0.32	
ID	258	71	2	9	1	12	11	0	364
	70.88	19.51	0.55	2.47	0.27	3.30	3.02	0.00	
IL	252	40	1	4	1	3	20	1	322
	78.26	12.42	0.31	1.24	0.31	0.93	6.21	0.31	
IN	317	56	3	3	1	8	12	0	400
	79.25	14.00	0.75	0.75	0.25	2.00	3.00	0.00	
IA	345	53	13	3	2	9	2	6	433
	79.68	12.24	3.00	0.69	0.46	2.08	0.46	1.39	
KS	288	31	2	4	0	3	10	0	338
	85.21	9.17	0.59	1.18	0.00	0.89	2.96	0.00	

FREQUENCIES FOR THE WEIGHT BASIS - BY STATE (cont.)

State	Basis for weight: Crop	Pasture	Hog	Cattle	Sheep	Grain Cap.	Ag Income	No Basis	Total trcts
KY	514	82	3	0	0	12	25	0	636
	80.82	12.89	0.47	0.00	0.00	1.89	3.93	0.00	
LA	197	58	5	6	2	0	22	2	292
	67.47	19.86	1.71	2.05	0.68	0.00	7.53	0.68	
ME	93	27	1	1	1	0	14	0	137
	67.88	19.71	0.73	0.73	0.73	0.00	10.22	0.00	
MD	236	27	3	0	0	1	19	0	286
	82.52	9.44	1.05	0.00	0.00	0.35	6.64	0.00	
MA	53	14	0	0	0	0	14	0	81
	65.43	17.28	0.00	0.00	0.00	0.00	17.28	0.00	
MI	229	35	4	7	0	4	18	0	297
	77.10	11.78	1.35	2.36	0.00	1.35	6.06	0.00	
MN	254	25	6	6	2	12	27	0	332
	76.51	7.53	1.81	1.81	0.60	3.61	8.13	0.00	
MS	254	118	51	8	0	5	50	0	486
	52.26	24.28	10.49	1.65	0.00	1.03	10.29	0.00	
MO	330	122	2	5	0	2	22	1	484
	68.18	25.21	0.41	1.03	0.00	0.41	4.55	0.21	
MT	191	42	0	0	0	1	1	0	235
	81.28	17.87	0.00	0.00	0.00	0.43	0.43	0.00	
NE	250	48	5	5	0	6	5	0	319
	78.37	15.05	1.57	1.57	0.00	1.88	1.57	0.00	
NV	70	21	1	1	0	0	4	0	97
	72.16	21.65	1.03	1.03	0.00	0.00	4.12	0.00	
NH	45	9	0	0	0	0	1	0	55
	81.82	16.36	0.00	0.00	0.00	0.00	1.82	0.00	
NJ	134	51	3	1	0	1	19	0	209
	64.11	24.40	1.44	0.48	0.00	0.48	9.09	0.00	

FREQUENCIES FOR THE WEIGHT BASIS - BY STATE (cont.)

# of trcts / Row % / State	Basis for weight: Crop	Pasture	Hog	Cattle	Sheep	Grain Cap.	Ag Income	No Basis	Total trcts
NM	146	94	7	10	2	3	15	3	280
	52.14	33.57	2.50	3.57	0.71	1.07	5.36	1.07	
NY	278	47	2	11	2	1	25	1	367
	75.75	12.81	0.54	3.00	0.54	0.27	6.81	0.27	
NC	206	55	13	2	1	1	26	0	304
	67.76	18.09	4.28	0.66	0.33	0.33	8.55	0.00	
ND	110	1	0	1	0	7	1	0	120
	91.67	0.83	0.00	0.83	0.00	5.83	0.83	0.00	
OH	349	52	3	5	1	8	18	0	436
	80.05	11.93	0.69	1.15	0.23	1.83	4.13	0.00	
OK	285	139	5	7	0	4	9	0	449
	63.47	30.96	1.11	1.56	0.00	0.89	2.00	0.00	
OR	174	205	1	5	0	2	26	1	414
	42.03	49.52	0.24	1.21	0.00	0.48	6.28	0.24	
PA	293	64	5	0	3	4	24	1	394
	74.37	16.24	1.27	0.00	0.76	1.02	6.09	0.25	
RI	12	1	0	2	1	0	4	0	20
	60.00	5.00	0.00	10.00	5.00	0.00	20.00	0.00	
SC	228	88	20	1	0	2	19	0	358
	63.69	24.58	5.59	0.28	0.00	0.56	5.31	0.00	
SD	146	13	1	1	1	2	2	0	166
	87.95	7.83	0.60	0.60	0.60	1.20	1.20	0.00	
TN	316	151	10	1	0	5	11	0	494
	63.97	30.57	2.02	0.20	0.00	1.01	2.23	0.00	
TX	637	422	7	14	1	6	32	2	1,121
	56.82	37.64	0.62	1.25	0.09	0.54	2.85	0.18	

FREQUENCIES FOR THE WEIGHT BASIS - BY STATE (cont.)

State	Basis for weight: Crop	Pasture	Hog	Cattle	Sheep	Grain Cap.	Ag Income	No Basis	Total trcts
UT	216	72	2	7	1	1	10	0	309
	69.90	23.30	0.65	2.27	0.32	0.32	3.24	0.00	
VT	75	6	1	0	0	0	2	0	84
	89.29	7.14	1.19	0.00	0.00	0.00	2.38	0.00	
VA	260	57	3	2	1	1	13	0	337
	77.15	16.91	0.89	0.59	0.30	0.30	3.86	0.00	
WA	235	135	4	3	2	4	17	0	400
	58.75	33.75	1.00	0.75	0.50	1.00	4.25	0.00	
WV	168	59	8	2	0	2	24	0	263
	63.88	22.43	3.04	0.76	0.00	0.76	9.13	0.00	
WI	298	15	6	5	1	5	7	1	338
	88.17	4.44	1.78	1.48	0.30	1.48	2.07	0.30	
WY	115	23	1	2	0	2	6	0	149
	77.18	15.44	0.67	1.34	0.00	1.34	4.03	0.00	
U.S.	10,826	3,515	271	228	39	159	822	26	15,886
	68.10	22.10	1.70	1.40	0.20	1.00	5.20	0.20	

APPENDIX D: STATISTICAL TESTS

This appendix describes the univariate statistical tests used. Paired t-tests were conducted since the commodity weighted and operational weighted estimates were generated for each tract.

Differences were calculated at the tract level and a t statistic was generated for the total difference.

Difference in the expansions at the tract level:

$$d_{hi} = e_{hi}\ n_{hi}\ w_{hi\text{--}commodity}\ z_{hi} - e_{hi}\ n_{hi}\ w_{hi\text{--}operational}\ z_{hi}$$

$$= e_{hi}\ \hat{Y}'_{hi\text{--}commodity} - e_{hi}\ \hat{Y}'_{hi\text{--}operational} = e_{hi}\ \hat{Y}'_{hi\text{--}difference}$$

Difference in the expansion totals:

$$\hat{Y}_D = \sum_{h=1}^{L} \sum_{i=1}^{t_h} d_{hi}$$

Variance of the total difference:

$$var(\hat{Y}_D) = var_1(\hat{Y}_D) + var_2(\hat{Y}_D)$$

Variances 1 and 2 are calculated using the same formulas as in Appendix A, with $\hat{Y}'_{hi\text{--}difference}$ being used instead of $\hat{Y}'_{hi}$.

The paired t-test:

$$Y_D = Y_{commodity} - Y_{operational}$$

To test $H_0: Y_D = 0$
$H_A: Y_D \neq 0$,

use $t = \dfrac{\hat{Y}_D}{s.e.(\hat{Y}_D)}$ and reject H_0 if $|t| > t_{alpha}$

Z tables were used to obtain significance levels since the t is approximated by the z when sample size is large. The $t_{alpha} = t_{.05} = 1.96$.

APPENDIX E: COMMODITY ESTIMATES AND CVs BY STATE

TABLE 1: Total Number of Hogs

State	Commodity weighted expansion	CV %	Operational weighted expansion	CV %	Relative dif. 1/ %	Sig. level
AL	69,746	15.6	179,087	18.5	-61.1	<.01*
AZ	9,010	31.8	9,318	32.0	-3.3	<.01*
AR	43,628	28.9	39,760	26.1	9.7	.35
CA	55,663	25.7	53,790	26.5	3.5	.29
CO	28,714	36.8	24,477	31.8	17.3	.33
CT	40	58.8	169	45.4	-76.5	.05*
DE	7,762	38.8	7,598	31.0	2.2	.90
FL	27,077	33.6	29,430	31.5	-8.0	.07
GA	169,680	19.4	156,983	18.3	8.1	.14
ID	9,995	42.9	9,292	38.4	7.6	.38
IL	773,734	30.1	739,050	27.4	4.7	.61
IN	739,218	24.5	545,410	23.1	35.5	.01*
IA	2,281,649	18.1	2,466,708	18.1	-7.5	.03*
KS	184,352	31.1	145,554	23.6	26.7	.34
KY	132,099	19.6	440,631	74.8	-70.0	.35
LA	14,392	24.1	14,160	24.3	1.6	.42
ME	2,057	29.2	2,218	26.0	-7.2	.23
MD	67,506	35.9	64,314	35.5	5.0	.25
MA	3,057	51.3	2,331	51.9	31.1	.05*
MI	138,153	26.5	117,270	25.9	17.8	.01*
MN	616,070	25.0	530,364	26.5	16.2	<.01*
MS	100,068	15.5	89,609	15.4	11.7	.01*
MO	366,715	24.1	408,757	23.4	-10.3	.18
MT	23,267	47.7	28,569	43.9	-18.6	.38
NE	563,886	28.5	525,380	27.4	7.3	.27
NV	1,913	41.2	1,686	41.9	13.5	.12
NH	6,626	46.5	5,973	42.2	10.9	.28
NJ	2,738	37.6	3,778	41.6	-27.5	.08
NM	11,584	45.0	14,051	40.7	-17.6	<.01*
NY	17,642	28.9	31,883	21.6	-44.7	<.01*
NC	89,937	23.9	175,764	27.9	-48.8	.03*
ND	8,636	108.4	21,796	105.3	-60.4	.35

TABLE 1 (cont.): Total Number of Hogs

State	Commodity weighted expansion	CV %	Operational weighted expansion	CV %	Relative dif. 1/ %	Sig. level
OH	960,835	18.8	630,216	20.3	52.5	<.01*
OK	50,788	28.8	50,196	28.8	1.2	.47
OR	10,373	26.4	9,336	24.2	11.1	.22
PA	196,516	22.9	180,255	23.2	9.0	.01*
RI	0	.	0	.	.	.
SC	223,345	25.8	124,783	15.6	79.0	.04*
SD	228,285	63.9	176,839	43.8	29.1	.51
TN	179,501	21.8	163,242	19.4	10.0	.41
TX	184,214	13.1	219,789	23.8	-16.2	.44
UT	8,927	44.7	8,506	46.5	5.0	.07
VT	1,062	26.8	1,094	26.5	-3.0	.06
VA	112,057	25.8	75,797	20.7	47.8	.02*
WA	17,910	21.7	17,609	22.0	1.7	.28
WV	5,141	23.7	6,213	23.8	-17.3	.01*
WI	336,614	36.6	345,194	25.4	-2.5	.94
WY	4,994	83.6	3,432	74.7	45.5	.34
U.S.	9,087,178	7.0	8,897,658	7.6	2.1	.64

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 2: Corn Harvested Acres

State	Commodity weighted expansion	CV %	Operational weighted expansion	CV %	Relative dif. 1/ %	Sig. level
AL	112,598	14.4	124,551	12.1	-9.6	.11
AZ	16,899	26.3	24,337	26.6	-30.6	.05*
AR	54,843	44.4	50,215	35.0	9.2	.64
CA	21,650	23.6	29,868	21.1	-27.5	.14
CO	253,972	14.5	272,603	20.9	-6.8	.58
CT	44	47.6	880	38.1	-95.0	.01*
DE	53,557	19.2	73,821	22.1	-27.5	.04*
FL	17,060	23.0	22,589	22.3	-24.5	.05*
GA	177,493	15.0	156,377	13.0	13.5	.18
ID	12,330	24.2	10,688	20.9	15.4	.29
IL	1,673,618	14.8	1,755,733	19.1	-4.7	.50
IN	1,698,253	9.8	1,467,538	9.8	15.7	<.01*
IA	2,624,225	9.1	2,711,279	9.2	-3.2	.19
KS	331,040	18.9	346,643	15.2	-4.5	.75
KY	341,844	14.7	315,837	10.7	8.2	.50
LA	267,784	21.4	266,335	20.1	0.5	.95
ME	0	.	81	46.8	-100.0	.03*
MD	156,033	18.7	141,300	15.4	10.4	.29
MA	931	48.7	574	47.9	62.3	.05*
MI	656,673	12.1	599,901	11.9	9.5	.03*
MN	1,068,183	12.4	871,111	12.0	22.6	<.01*
MS	45,935	14.5	58,896	16.4	-22.0	.04*
MO	386,095	17.8	341,092	15.5	13.2	.08
MT	12,194	38.6	10,625	38.8	14.8	.72
NE	1,290,636	10.9	1,108,370	11.0	16.4	<.01*
NV	0	.	0	.	.	.
NH	0	.	0	.	.	.
NJ	4,936	36.4	6,896	30.9	-28.4	.06
NM	437	30.9	3,210	39.7	-86.4	.02*
NY	139,841	35.1	150,407	28.1	-7.0	.56
NC	416,845	25.3	472,505	20.8	-11.8	.33
ND	9,391	62.8	20,731	27.3	-54.7	.12

TABLE 2 (cont.): Corn Harvested Acres

State	Commodity weighted expansion	CV %	Operational weighted expansion	CV %	Relative dif. 1/ %	Sig. level
OH	1,255,162	11.3	1,019,519	9.7	23.1	.01*
OK	6,691	48.7	6,813	51.0	-1.8	.87
OR	1,774	48.0	1,592	50.5	11.5	.01*
PA	380,647	15.2	341,496	13.1	11.5	.14
RI	0	.	444	61.7	-100.0	.11
SC	238,904	16.5	293,103	21.3	-18.5	.20
SD	357,855	19.4	379,331	17.9	-5.7	.41
TN	165,075	27.2	154,694	23.2	6.7	.58
TX	116,947	20.1	145,846	17.4	-19.8	.09
UT	4,902	45.7	3,666	51.2	33.7	.03*
VT	0	.	0	.	.	.
VA	156,311	14.8	147,608	16.7	5.9	.59
WA	66,277	22.2	81,208	38.1	-18.4	.60
WV	7,968	24.2	116,883	97.4	-93.2	.34
WI	890,988	10.9	944,855	11.2	-5.7	.21
WY	7,041	62.3	7,545	59.0	-6.7	<.01*
U.S.	15,501,878	3.3	15,059,595	3.6	2.9	.08

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 3: Soybean Harvested Acres

State	Commodity weighted expansion	CV %	Operational weighted expansion	CV %	Relative dif. 1/ %	Sig. level
AL	377,385	12.9	358,779	12.0	5.2	.42
AR	663,804	22.9	607,053	21.8	9.3	.32
DE	76,125	25.1	65,010	19.6	17.1	.25
FL	30,377	35.6	43,662	43.6	-30.4	.41
GA	127,072	15.9	222,612	16.5	-42.9	<.01*
IL	1,408,254	20.7	1,489,776	28.4	-5.5	.62
IN	1,429,186	10.1	1,223,665	9.9	16.8	<.01*
IA	1,946,526	9.1	1,943,716	9.2	0.1	.96
KS	681,101	47.2	507,571	13.7	34.2	.56
KY	328,215	17.9	272,705	12.3	20.4	.21
LA	696,244	15.7	734,242	14.8	-5.2	.39
MD	148,150	24.1	121,957	13.9	21.5	.31
MI	199,071	15.2	158,853	14.1	25.3	<.01*
MN	610,893	13.6	515,949	12.9	18.4	<.01*
MS	602,044	19.1	614,474	17.6	-2.0	.67
MO	850,814	16.5	743,586	15.0	14.4	.04*
NE	390,111	12.5	363,393	12.5	7.4	.18
NJ	15,387	88.7	20,701	93.6	-25.7	.36
NC	319,274	21.5	360,771	20.7	-11.5	.43
ND	12,423	75.3	17,716	55.7	-29.9	.06
OH	891,421	11.0	837,571	10.9	6.4	.25
OK	74,647	29.6	68,389	31.0	9.1	.25
PA	25,607	21.7	23,985	18.8	6.8	.42
SC	269,979	18.2	410,952	25.2	-34.3	.07
SD	163,970	24.8	163,701	23.1	0.2	.99
TN	219,273	25.0	230,951	25.0	-5.1	.67
TX	62,065	39.8	45,414	30.5	36.7	.16
VA	231,824	14.7	208,687	15.8	11.1	.21
WI	114,991	23.6	82,252	18.1	39.8	.08
U.S.	12,966,233	4.6	12,458,095	4.6	4.1	.18

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 4: Winter Wheat Harvested Acres

State	Commodity weighted expansion	CV %	Operational weighted expansion	CV %	Relative dif. 1/ %	Sig. level
AL	145,906	18.0	98,362	16.0	48.3	<.01*
AZ	7,905	26.4	4,778	23.0	65.4	<.01*
AR	166,904	24.8	170,188	24.8	-1.9	.78
CA	75,653	19.7	117,247	18.6	-35.5	.01*
CO	614,031	17.7	652,449	17.6	-5.9	.55
DE	23,803	32.2	19,351	25.7	23.0	.23
FL	22,967	22.0	73,703	87.2	-68.8	.43
GA	75,520	22.5	151,645	20.8	-50.2	<.01*
ID	161,456	15.2	224,571	14.4	-28.1	<.01*
IL	155,032	42.0	160,634	63.5	-3.5	.89
IN	219,574	12.5	177,151	12.4	23.9	<.01*
IA	14,216	38.5	15,680	36.3	-9.3	.02*
KS	2,185,812	12.2	2,070,419	12.9	5.6	.37
KY	34,974	23.2	37,800	22.8	-7.5	.15
LA	78,410	29.2	69,168	25.1	13.4	.42
MD	47,265	27.1	36,814	17.2	28.4	.23
MI	175,957	15.2	158,944	15.2	10.7	<.01*
MN	4,364	22.5	4,887	27.7	-10.7	.16
MS	16,016	26.1	20,928	23.0	-23.5	.13
MO	234,630	35.8	144,283	35.1	62.6	.01*
MT	441,113	19.0	529,811	19.1	-16.7	.10
NE	354,028	20.1	303,230	19.2	16.8	.03*
NV	946	63.8	2,023	48.1	-53.2	.27
NJ	319	53.5	585	47.7	-45.6	.19
NM	83,560	32.4	106,262	29.6	-21.4	.01*
NY	54,036	43.1	39,962	30.8	35.2	.29
NC	64,573	27.7	92,559	23.7	-30.2	.03*
ND	11,105	57.0	15,198	67.1	-26.9	.39
OH	261,394	11.5	231,737	10.9	12.8	.03*
OK	969,344	15.5	871,989	14.4	11.2	.21
OR	73,601	38.7	78,862	36.8	-6.7	.49
PA	33,997	18.1	39,065	19.4	-13.0	.20
SC	119,646	19.0	183,769	25.5	-34.9	.07
SD	191,227	36.3	206,758	31.9	-7.5	.26
TN	58,482	36.8	60,150	36.1	-2.8	.88
TX	389,456	14.9	404,966	14.0	-3.8	.59
UT	82,319	31.7	52,227	29.8	57.6	.01*
VA	59,617	21.1	55,554	21.0	7.3	.55
WA	755,298	17.1	705,114	16.5	7.1	.41
WV	1,352	39.4	1,650	38.1	-18.1	<.01*
WI	52,715	24.6	38,466	22.9	37.0	.03*
WY	44,838	90.4	102,990	71.7	-56.5	.09
U.S.	8,563,363	4.8	8,531,929	4.8	.4	.88

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 5: Oat Harvested Acres

State	Commodity weighted expansion	CV %	Operational weighted expansion	CV %	Relative dif. 1/ %	Sig. level
CT	0	.	754	58.8	-100.0	.09
DE	575	34.6	537	34.6	7.1	.06
ID	11,483	33.7	11,909	31.4	-3.6	.63
IL	29,379	23.4	31,450	23.2	-6.6	.57
ME	7,913	64.0	6,554	37.7	20.7	.70
MD	5,015	27.4	4,447	26.7	12.8	.08
MA	61	67.4	90	67.4	-32.2	.14
MN	178,495	14.8	141,722	15.5	25.9	<.01*
MT	21,891	31.1	10,033	27.4	118.2	.04*
NH	0	.	70	34.2	-100.0	<.01*
NJ	269	93.2	285	92.5	-5.9	.24
ND	37,931	24.5	65,409	25.6	-42.0	.02*
OR	12,985	32.9	14,058	39.4	-7.6	.52
PA	108,291	16.7	104,177	15.2	3.9	.67
RI	0	.	0	.	.	.
SD	83,145	25.3	89,153	20.3	-6.7	.53
UT	4,325	21.6	3,694	21.7	17.1	.07
VT	548	71.8	940	72.9	-41.7	.18
WA	11,356	27.4	13,984	30.6	-18.8	.21
WV	1,107	37.1	1,543	38.8	-28.3	.03*
WY	4,380	39.2	9,250	37.4	-52.7	.02*
U.S.	519,147	8.0	510,060	7.6	1.8	.67

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 6: Sorghum Harvested Acres

State	Commodity weighted expansion	CV %	Operational weighted expansion	CV %	Relative dif. 1/ %	Sig. level
AL	44,533	18.2	48,996	15.9	-9.1	.47
AZ	1,356	27.4	974	23.3	39.2	.04*
AR	71,966	32.9	87,483	26.5	-17.7	.30
CA	1,513	39.1	2,277	52.5	-33.5	.54
CO	62,835	20.6	46,912	19.9	33.9	.11
GA	19,511	25.7	13,482	21.4	44.7	.01*
IL	29,322	35.6	25,602	55.9	14.5	.57
KS	1,487,486	27.8	1,214,898	12.4	22.4	.43
KY	12,201	51.8	10,237	38.2	19.2	.49
LA	157,951	28.5	178,220	24.2	-11.4	.23
MS	41,635	23.9	47,868	22.5	-13.0	.22
MO	330,502	39.8	256,974	32.7	28.6	.16
NE	224,123	18.3	237,517	19.9	-5.6	.52
NM	52,298	30.0	51,497	27.3	1.6	.88
NC	30	47.0	238	51.6	-87.3	.08
OK	71,492	19.6	76,669	19.2	-6.8	.70
SC	6,857	36.5	15,691	36.6	-56.3	.04*
SD	41,257	33.0	36,343	27.8	13.5	.44
TN	14,177	36.1	26,501	36.3	-46.5	.03*
TX	503,167	14.5	510,141	13.5	-1.4	.76
U.S.	3,174,216	14.1	2,888,520	6.9	9.9	.42

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 7: Rye Seedings

State	Commodity weighted expansion	CV %	Operational weighted expansion	CV %	Relative dif. 1/ %	Sig. level
AL	111,065	17.2	73,946	13.9	50.2	<.01*
CO	1,647	42.6	5,424	41.1	-69.6	.02*
DE	613	33.4	641	32.0	-4.3	.04*
GA	141,337	18.2	132,730	17.9	6.5	.39
IL	13,512	7.1	13,179	18.9	2.5	.85
IN	1,567	21.2	2,777	27.0	-43.6	.08
IA	0	.	0	.	.	.
KS	3,820	21.2	3,108	22.2	22.9	.18
KY	9,654	26.3	7,451	21.6	29.6	.13
MD	19,685	20.8	15,211	16.2	29.4	.09
MI	17,540	18.7	15,404	19.3	13.9	.14
MN	7,641	24.6	7,094	26.0	7.7	.04*
MO	4,391	45.1	1,919	28.5	128.8	.10
NE	5,219	42.9	5,128	42.5	1.8	.84
NJ	4,926	41.5	3,737	37.9	31.8	.16
NY	1,966	54.1	5,017	43.4	-60.8	.01*
NC	32,038	24.7	32,533	21.4	-1.5	.93
ND	9,184	50.9	14,619	44.5	-37.2	.03*
OH	19,002	28.2	19,896	25.9	-4.5	.16
OK	50,356	30.0	30,227	27.7	66.6	.05*
OR	25,602	57.8	18,407	56.1	39.1	.11
PA	28,299	30.6	25,799	25.9	9.7	.41
SC	19,562	22.4	21,518	21.4	-9.1	.61
SD	5,657	36.4	2,833	35.4	99.7	.02*
TX	6,347	32.5	44,424	81.2	-85.7	.29
VA	71,767	19.3	105,059	26.8	-31.7	.17
WI	7,001	43.3	5,884	40.4	19.0	.16
U.S.	619,399	7.1	613,963	9.2	0.9	.91

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 8: Corn Stocks

State	Commodity weighted expansion (1000)	CV %	Operational weighted expansion (1000)	CV %	Relative dif. 1/ %	Sig. level
AL	2,318	23.1	2,133	24.3	8.6	.15
AZ	13	40.0	342	68.8	-96.3	.16
AR	1,409	52.3	996	44.8	41.4	.16
CA	3,714	38.7	4,820	41.6	-22.9	.24
CO	18,993	35.9	17,414	29.8	9.1	.62
DE	1,470	51.6	4,889	95.0	-69.9	.38
FL	91	27.8	239	24.0	-61.8	<.01*
GA	2,630	19.6	2,690	18.1	-2.2	.84
ID	1,597	34.6	2,222	31.2	-28.2	<.01*
IL	111,558	12.3	109,859	12.5	1.5	.58
IN	104,958	10.1	89,769	10.0	16.9	<.01*
IA	243,560	10.3	264,634	9.9	-8.0	<.01*
KS	4,248	44.7	4,490	18.5	-5.4	.89
KY	13,098	12.6	19,246	21.2	-31.9	.11
LA	26	37.2	22	33.7	17.2	.32
MD	2,384	25.6	2,070	27.1	15.2	.02*
MI	32,896	13.8	27,233	13.0	-69.0	<.01*
MN	92,523	14.4	85,694	13.1	8.0	.07
MS	1,030	15.3	1,217	14.0	-15.4	.02*
MO	23,030	20.9	26,336	23.3	-12.6	.54
MT	319	22.3	581	34.8	-45.1	.17
NE	106,942	14.1	95,001	12.9	12.6	.05*
NJ	787	46.8	891	41.6	-11.6	.06
NM	1	34.2	1	35.1	26.9	.03*
NY	12,888	24.9	13,088	22.4	-1.5	.93
NC	9,869	23.2	10,490	20.2	-5.9	.51
ND	892	67.0	1,534	32.5	-41.9	.36
OH	48,838	10.7	46,740	9.6	4.5	.33
OK	147	24.4	159	21.6	-7.3	.33
OR	1	27.3	1	29.1	8.8	.13
PA	33,800	14.0	32,920	13.0	2.7	.61
SC	6,853	19.9	5,941	18.6	15.3	.14
SD	24,368	24.9	24,019	22.6	1.5	.88
TN	4,383	26.8	4,851	24.8	-9.7	.45
TX	1,124	19.6	1,750	22.4	-35.8	.08
UT	49	33.4	57	35.3	-15.1	.51
VA	4,901	19.2	5,174	18.1	-5.3	.75
WA	2,240	31.0	3,227	73.2	-30.6	.68
WV	4,881	36.4	5,603	35.2	-12.9	.15
WI	67,546	12.0	71,120	11.4	-5.0	.24
WY	2,207	26.2	3,017	40.4	-26.8	.37
U.S.	994,579	4.0	992,481	3.9	.2	.89

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 9: Soybeans Stocks

State	Commodity weighted expansion (1000)	CV %	Operational weighted expansion (1000)	CV %	Relative dif. 1/ %	Sig. level
AL	1,695	15.5	2,149	15.1	-21.1	.09
AR	4,144	18.6	4,021	19.4	3.1	.77
DE	1,814	34.7	3,692	78.1	-50.9	.44
FL	11	25.2	159	100.7	-93.1	.35
GA	1,523	18.4	1,745	16.1	-12.7	.21
IL	20,260	16.5	19,690	18.8	2.9	.67
IN	27,884	10.8	22,290	10.4	25.1	<.01*
IA	40,867	11.0	41,761	11.0	-2.1	.49
KS	10,671	62.4	7,088	15.8	50.6	.56
KY	5,951	16.9	5,627	15.0	5.8	.65
LA	1,006	26.9	1,564	21.1	-35.7	.02*
MD	1,863	29.9	1,421	34.7	31.1	.04*
MI	2,612	17.3	1,833	15.5	42.5	<.01*
MN	17,524	15.4	16,317	14.9	7.4	.14
MS	2,622	19.6	2,699	15.9	-2.9	.74
MO	14,659	16.3	15,516	15.5	-5.5	.60
NE	8,168	18.2	7,147	19.2	14.3	<.01*
NJ	234	59.6	307	61.5	-23.8	.19
NC	5,492	23.5	5,639	20.1	-2.6	.86
ND	269	70.2	340	58.7	-20.9	.23
OH	8,655	13.8	10,021	14.0	-13.6	.06
OK	1,595	27.3	1,416	24.6	12.6	.17
SC	3,482	17.1	4,830	16.9	-27.9	<.01*
SD	2,178	37.5	1,704	29.9	27.8	.21
TN	2,672	36.9	2,336	30.7	14.4	.61
TX	389	28.2	644	28.6	-39.7	<.01*
VA	6,096	16.8	5,461	17.6	11.6	.23
WI	566	25.1	690	25.9	-18.0	.09
U.S.	194,902	5.4	188,104	4.5	3.6	.37

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 10: All Wheat Stocks

State	Commodity weighted expansion (1000)	CV %	Operational weighted expansion (1000)	CV %	Relative dif. 1/ %	Sig. level
AL	283	23.6	171	22.6	65.3	<.01*
AZ	3	37.1	65	68.2	-95.7	.16
AR	77	24.6	103	26.4	-25.3	.27
CA	3,107	38.3	3,873	38.7	-19.8	.21
CO	12,388	22.0	11,167	20.5	10.9	.24
DE	0	.	0	.	.	.
FL	72	22.3	1,826	105.2	-96.1	.36
GA	148	26.3	236	21.2	-37.3	.02*
ID	13,230	19.5	13,033	19.4	1.5	.90
IL	508	38.1	242	41.1	109.5	.01*
IN	3	22.0	5	28.5	-51.5	.05*
IA	64	35.1	108	37.0	-40.9	.01*
KS	14,309	15.1	14,479	14.8	-1.2	.87
KY	3	42.6	3	45.3	-5.0	.35
LA	0	.	0	.	.	.
MD	12	34.7	11	39.5	17.0	.05*
MI	137	19.0	145	19.0	-5.7	.29
MN	22,248	17.2	21,191	17.5	5.0	.21
MS	10	33.6	8	40.2	34.4	.16
MO	1,365	22.3	972	18.9	40.4	.01*
MT	17,627	18.0	19,613	17.5	-10.1	.15
NE	4,999	23.9	4,572	22.4	9.4	.39
NV	36	63.2	24	62.9	47.7	.12
NJ	0	.	0	.	.	.
NM	223	34.8	261	33.4	-14.4	.08
NY	1,700	97.7	1,116	76.8	52.4	.47
NC	210	61.5	131	60.8	61.1	.11
ND	22,358	25.9	24,472	24.3	-8.6	.43
OH	1,023	35.1	287	15.9	256.2	.03*
OK	3,344	22.3	4,052	20.1	-17.5	<.01*
OR	419	37.3	606	35.4	-30.9	.33
PA	424	36.7	450	35.1	-5.7	.16
SC	201	40.7	200	24.8	0.1	1.00
SD	7,598	22.5	7,839	21.8	-3.1	.73
TN	747	54.9	199	52.4	274.6	.11
TX	131	29.1	80	30.5	64.0	.03*
UT	4,949	23.6	4,164	24.0	18.9	.06
VA	664	26.4	719	28.8	-7.8	.51
WA	17,323	20.4	13,008	16.5	33.2	.04*
WV	19	25.3	37	32.4	-48.9	.09
WI	291	28.1	205	24.1	41.5	.08
WY	4,563	39.6	10,971	54.7	-58.4	.16
U.S.	156,812	6.5	160,644	7.1	-2.4	.57

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 11: Hay Stocks

State	Commodity weighted expansion (1000)	CV %	Operational weighted expansion (1000)	CV %	Relative dif. 1/ %	Sig. level
AL	523	13.0	443	10.2	17.9	.02*
AZ	35	26.7	43	31.8	-17.5	.33
AR	1,332	15.2	1,338	13.5	-0.4	.96
CA	1,905	18.4	2,111	32.5	-9.8	.70
CO	655	14.8	1,036	17.7	-36.7	.01*
CT	36	39.1	55	34.8	-34.8	.02*
DE	4	51.9	14	93.0	-68.3	.38
FL	250	20.7	211	17.2	18.6	.36
GA	277	15.7	309	15.3	-10.5	.11
ID	948	20.0	759	19.4	24.9	.01*
IL	398	18.2	346	16.9	15.2	.12
IN	896	12.2	723	11.7	23.9	<.01*
IA	901	11.8	1,014	11.8	-11.2	.01*
KS	1,483	28.0	1,311	14.5	13.1	.62
KY	964	9.2	1,051	9.1	-8.4	.02*
LA	513	13.6	556	12.2	-7.7	.20
ME	188	21.4	186	21.2	1.3	.88
MD	212	50.8	202	53.0	4.7	.02*
MA	73	23.3	72	23.1	2.2	.41
MI	791	31.6	791	31.5	-13.3	.99
MN	1,311	16.0	1,205	15.7	8.8	.02*
MS	535	13.3	529	11.4	1.0	.89
MO	2,700	10.7	2,547	8.4	6.0	.41
MT	899	20.0	798	21.8	12.7	.11
NE	925	14.8	1,068	16.1	-13.4	.26
NV	429	29.6	258	32.3	66.2	<.01*
NH	151	47.5	124	42.9	21.4	.15
NJ	34	34.6	36	35.4	-6.5	.30
NM	396	51.5	390	51.4	1.6	.23
NY	1,581	43.8	1,984	32.2	-20.3	.04*
NC	137	15.2	137	13.9	0.1	1.00
ND	539	24.4	748	27.0	-27.9	.08

TABLE 11 (cont.): Hay Stocks

State	Commodity weighted expansion (1000)	CV %	Operational weighted expansion (1000)	CV %	Relative dif. 1/ %	Sig. level
OH	1,021	10.0	930	9.9	9.8	<.01*
OK	2,905	37.3	2,785	38.6	4.3	.22
OR	869	20.0	621	20.2	39.9	.01*
PA	1,098	13.0	1,110	12.0	-1.1	.86
RI	0	243.9	4	205.9	-89.9	.62
SC	207	15.3	215	13.8	-4.1	.71
SD	643	22.5	729	19.8	-11.8	.22
TN	900	11.4	933	11.1	-3.5	.24
TX	4,032	10.1	4,762	9.2	-15.3	.04*
UT	511	19.0	462	19.6	10.7	.06
VT	299	22.5	229	20.8	30.4	.01*
VA	860	16.6	895	13.3	-3.9	.56
WA	670	15.7	715	15.2	-6.3	.17
WV	346	19.6	677	38.9	-48.8	.19
WI	4,227	20.0	4,011	16.0	5.4	.43
WY	584	27.4	722	30.0	-19.0	.21
U.S.	41,195	4.5	42,197	4.3	-2.4	.29

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 12: Grain Storage Capacity

State	Commodity weighted expansion (1000)	CV %	Operational weighted expansion (1000)	CV %	Relative dif. 1/ %	Sig. level
AL	22,581	15.6	18,792	15.9	20.2	.01*
AZ	103	34.3	99	32.1	3.1	.79
AR	26,623	33.9	21,699	30.0	22.7	.25
CA	1,652	37.1	1,213	28.6	36.2	.35
CO	58,835	18.7	56,198	16.5	4.7	.56
DE	6,870	40.3	8,935	86.8	-23.1	.75
FL	180	27.0	5,482	102.2	-96.7	.34
GA	19,952	16.9	20,412	15.8	-2.3	.69
ID	45,455	17.4	56,185	51.5	-19.1	.69
IL	155,513	12.7	161,990	12.7	-4.0	.14
IN	180,685	10.5	144,174	9.9	25.3	<.01*
IA	327,863	9.9	345,552	9.6	-5.1	.05*
KS	79,724	24.0	77,915	20.9	2.3	.93
KY	39,706	13.3	59,545	41.6	-33.3	.42
LA	13,938	43.9	11,912	40.6	17.0	.21
MD	11,329	30.0	11,902	32.8	-4.8	.74
MI	53,417	19.0	46,448	20.4	-65.7	<.01*
MN	154,321	12.9	150,082	12.1	2.8	.46
MS	11,168	25.0	10,727	18.8	4.1	.69
MO	70,769	17.2	68,942	17.8	2.7	.89
MT	66,937	16.7	63,090	16.0	6.1	.46
NE	163,118	12.9	142,336	12.7	14.6	<.01*
NV	1,461	56.8	698	49.9	109.2	.12
NJ	5,731	39.0	8,402	37.6	-31.8	.02*
NM	4,843	64.2	5,076	61.5	-4.6	.01*
NY	31,813	20.0	33,363	18.8	-4.6	.68
NC	32,687	29.0	32,299	23.4	1.2	.90
ND	50,844	24.3	61,830	23.4	-17.8	.07
OH	78,197	13.0	78,840	12.5	-0.8	.85
OK	33,117	15.8	30,924	15.5	7.1	.31
OR	4,895	31.1	3,813	26.0	28.4	.12
PA	46,528	13.9	43,442	12.8	7.1	.27
SC	21,844	16.3	19,620	14.7	11.3	.21
SD	67,536	20.7	74,236	18.9	-9.0	.09
TN	32,395	26.2	28,479	23.8	13.7	.21
TX	32,868	16.5	33,168	16.0	-0.9	.88
UT	11,257	20.8	9,706	20.9	16.0	.04*
VA	17,243	14.2	31,109	38.4	-44.6	.24
WA	63,289	34.6	48,979	36.1	29.2	.02*
WV	11,596	29.8	12,237	29.6	-5.2	.54
WI	121,395	11.2	131,236	10.9	-7.5	.03*
WY	17,915	36.4	29,520	49.7	-39.3	.26
U.S.	2,198,192	3.3	2,200,609	3.6	-.1	.96

1/ Relative difference=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

* denotes differences that are significant at alpha= .05.

(this page intentionally blank)

TABLE 13: Number of Farms

State	Commodity weighted expansion	CV %	Operation. weighted expansion	CV %	Rel dif.1/ %	Sig. level	RFO expansion	CV %	Rel dif.2/ %
AL	40,604	8.9	41,734	8.8	-2.7	.18	34,112	9.8	19.0
AZ	4,842	19.6	5,066	20.3	-4.4	.23	5,288	22.9	-8.4
AR	26,344	10.2	25,901	9.9	1.7	.59	22,849	12.1	15.3
CA	61,359	8.4	66,050	8.4	-7.1	<.01*	52,629	9.4	16.6
CO	15,920	12.4	16,020	12.7	-0.6	.83	11,217	14.9	41.9
CT	2,290	49.5	2,264	43.7	1.2	.90	2,094	50.5	9.4
DE	2,085	24.2	2,421	26.4	-13.9	.03*	1,171	20.5	78.1
FL	29,505	14.7	29,441	14.5	0.2	.84	20,216	15.9	46.0
GA	31,080	9.6	33,082	9.2	-6.1	.02*	26,604	9.8	16.8
ID	14,139	20.3	14,241	19.9	-0.7	.74	11,788	21.7	19.9
IL	28,370	10.8	25,753	11.0	10.2	<.01*	20,217	11.6	40.3
IN	37,189	8.6	33,359	8.7	11.5	<.01*	29,418	9.0	26.4
IA	40,613	8.2	43,145	8.2	-5.9	<.01*	37,982	8.9	6.9
KS	23,116	11.1	24,755	14.7	-6.6	.46	19,036	13.2	21.4
KY	62,067	6.8	57,964	6.8	7.1	<.01*	52,486	7.2	18.3
LA	25,041	10.1	24,464	9.8	2.4	.35	19,152	10.9	30.7
ME	5,810	18.6	5,917	19.1	-1.8	.68	5,818	19.8	-0.1
MD	9,053	13.1	8,600	12.1	5.3	.16	6,353	10.4	42.5
MA	4,444	20.6	4,369	20.6	1.7	.38	3,729	21.1	19.2
MI	33,674	11.4	32,363	11.5	4.1	.16	28,149	12.2	19.6
MN	37,786	10.8	36,355	10.7	3.9	.03*	30,839	11.1	22.5
MS	31,245	8.4	30,176	8.2	3.5	.15	28,822	8.8	8.4
MO	69,526	7.0	69,276	6.8	0.4	.86	63,271	7.5	9.9
MT	10,500	20.6	10,812	21.1	-2.9	.48	9,624	26.6	9.1
NE	21,930	10.3	19,533	10.2	12.3	<.01*	16,659	14.2	31.6
NV	1,395	27.8	1,033	28.6	35.0	<.01*	766	28.3	82.0
NH	3,327	21.7	2,957	20.7	12.5	.01*	2,805	19.5	18.6
NJ	3,475	24.7	4,093	24.7	-15.1	.03*	3,664	24.2	-5.2
NM	5,613	31.1	5,475	28.5	2.5	.69	4,767	30.6	17.7
NY	22,673	9.2	23,587	9.1	-3.9	.08	19,751	9.7	14.8
NC	39,811	11.6	35,978	11.4	10.7	<.01*	35,008	11.8	13.7
ND	5,541	24.0	6,580	22.4	-15.8	.02*	4,984	30.5	11.2

TABLE 13 (cont.): Number of Farms

State	Commodity weighted expansion	CV %	Operation. weighted expansion	CV %	Rel dif.1/ %	Sig. level	RFO expansion	CV %	Rel dif.2/ %
OH	53,068	8.0	50,458	8.0	5.2	<.01*	43,879	8.3	20.9
OK	42,246	8.9	42,093	8.7	0.4	.87	33,351	10.1	26.7
OR	25,677	13.6	25,838	13.6	-0.6	.76	24,828	13.4	3.4
PA	34,556	10.0	35,036	9.8	-1.4	.71	29,955	10.8	15.4
RI	144	488.8	231	427.8	-37.6	.76	93	525.0	54.6
SC	22,419	9.2	21,930	9.0	2.2	.40	18,096	9.8	23.9
SD	7,333	17.4	8,007	16.8	-8.4	.05*	6,802	20.0	7.8
TN	66,030	10.1	61,174	9.6	7.9	<.01*	54,471	10.3	21.2
TX	128,240	6.4	132,486	6.2	-3.2	.05*	90,877	7.4	41.1
UT	5,620	16.2	5,716	17.8	-1.7	.86	4,262	22.3	31.9
VT	4,930	15.4	3,822	15.6	29.0	<.01*	4,706	16.3	4.8
VA	36,467	9.3	37,171	9.2	-1.9	.53	29,099	10.1	25.3
WA	28,127	12.6	28,897	12.7	-2.7	.16	27,099	13.6	3.8
WV	10,788	12.7	12,586	12.1	-14.3	<.01*	13,134	13.1	-17.9
WI	31,142	9.3	32,404	9.1	-3.9	.10	26,206	10.7	18.8
WY	2,409	24.5	2,317	24.7	4.0	.32	1,675	22.8	43.8
U.S.	1,249,564	1.7	1,242,929	1.7	0.5	.25	1,039,802	1.9	20.2

1/ Relative difference 1=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

2/ Relative difference 2=

$$100 * \frac{\text{(commodity wtd. expansion - RFO expansion)}}{\text{RFO expansion}}$$

* denotes differences that are significant at alpha= .05.

TABLE 14: Land in Farms

State	Commodity weighted expansion (1000)	CV %	Operation. tract expansion (1000)	CV %	Rel dif. 1/ %	Sig. level	RFO expansion (1000)	CV %	Rel dif. 2/ %
AL	6,348	9.4	4,968	7.8	27.8	<.01*	3,565	9.6	78.1
AZ	21,902	24.7	20,270	26.4	8.0	<.01*	22,150	24.5	-1.1
AR	6,288	13.1	4,901	10.4	28.3	<.01*	8,030	46.3	-21.7
CA	27,676	26.4	14,984	12.9	84.7	.06	18,818	37.1	47.1
CO	26,936	11.5	14,215	15.0	89.5	<.01*	10,342	28.7	160.4
CT	110	41.8	105	36.1	4.7	.81	275	46.5	-60.1
DE	199	24.6	184	24.3	7.8	.43	87	22.5	129.7
FL	12,715	24.6	7,408	14.2	71.6	.05*	4,518	23.6	181.4
GA	4,208	11.1	4,391	10.1	-4.2	.43	3,713	14.6	13.3
ID	4,647	20.5	3,077	16.6	51.0	.02*	2,886	20.5	61.0
IL	4,830	13.4	4,121	12.4	17.2	<.01*	3,112	14.2	55.2
IN	6,892	9.7	4,616	8.9	49.3	<.01*	4,012	10.7	71.8
IA	8,671	9.5	7,217	8.6	20.2	<.01*	7,913	11.1	9.6
KS	14,900	12.3	10,234	11.5	45.6	<.01*	11,860	16.6	25.6
KY	6,660	7.7	6,134	7.4	8.6	.01*	6,072	9.2	9.7
LA	5,114	11.9	4,193	9.9	22.0	.01*	5,445	18.1	-6.1
ME	743	21.2	640	19.2	16.1	.06	517	18.2	43.6
MD	1,092	18.0	798	12.0	36.8	.03*	636	13.4	71.8
MA	289	22.1	282	22.5	2.7	.04*	297	24.9	-2.6
MI	3,743	11.4	2,990	11.1	25.2	<.01*	2,491	12.4	50.3
MN	7,063	12.1	5,946	11.9	18.8	<.01*	5,497	12.8	28.5
MS	4,850	10.1	4,461	9.1	8.7	.14	4,293	12.2	13.0
MO	14,536	9.2	11,528	7.2	26.1	<.01*	9,836	8.9	47.8
MT	16,454	18.7	11,808	21.2	39.3	<.01*	8,154	27.6	101.8
NE	13,153	15.0	10,813	13.9	21.6	.13	13,524	38.8	-2.7
NV	2,477	67.5	1,616	95.5	53.3	<.01*	1,579	101.7	56.9
NH	363	24.2	329	23.1	10.3	.08	388	22.8	-6.3
NJ	167	26.4	175	27.1	-4.8	.48	144	22.6	15.8
NM	5,840	46.0	5,557	47.2	5.1	.24	2,949	44.4	98.1
NY	3,271	10.0	2,880	9.2	13.6	.01*	2,348	10.9	39.3
NC	3,783	14.4	2,887	13.4	31.1	<.01*	2,707	20.1	39.8
ND	4,028	23.0	3,790	24.2	6.3	.65	2,848	40.4	41.4

TABLE 14 (cont.): Land in Farms

State	Commodity weighted expansion (1000)	CV %	Operation. tract expansion (1000)	CV %	Rel dif.1/ %	Sig. level	RFO expan- sion (1000)	CV %	Rel dif.2/ %
OH	7,179	9.5	5,004	8.1	43.5	<.01*	5,982	11.7	20.0
OK	22,991	17.0	12,681	9.3	81.3	<.01*	19,594	33.1	17.3
OR	11,260	36.4	4,183	16.9	169.2	.07	3,590	20.6	213.6
PA	3,165	11.4	3,167	11.3	-0.1	.99	2,660	13.7	19.0
RI	7	439.4	24	444.6	-71.8	.82	9	589.9	-26.6
SC	4,014	19.8	2,265	10.0	77.2	.02*	3,670	29.6	9.4
SD	4,874	19.5	6,153	18.9	-20.8	.05*	7,585	39.9	-35.7
TN	5,589	12.0	4,892	11.3	14.2	<.01*	3,879	12.8	44.1
TX	62,598	9.0	55,495	8.1	12.8	.03*	37,518	14.9	66.9
UT	3,879	27.8	2,286	55.3	69.7	.05*	2,317	55.7	67.4
VT	1,091	20.0	682	17.0	60.0	<.01*	925	20.2	17.9
VA	6,357	14.5	4,794	10.6	32.6	.03*	3,684	12.9	72.5
WA	8,337	16.2	4,486	12.9	85.8	<.01*	5,723	18.2	45.7
WV	1,310	18.5	1,386	13.6	-5.5	.54	1,696	19.7	-22.8
WI	5,209	10.1	5,163	10.0	0.9	.78	4,702	12.2	10.8
WY	8,978	34.0	4,345	30.8	106.6	.02*	2,224	39.5	303.7
U.S.	396,785	3.7	294,524	3.2	34.7	<.01*	276,765	5.6	43.4

1/ Relative difference 1=

$$100 * \frac{\text{(commodity wtd. expansion - operational wtd. expansion)}}{\text{operational wtd. expansion}}$$

2/ Relative difference 2=

$$100 * \frac{\text{(commodity wtd. expansion - RFO expansion)}}{\text{RFO expansion}}$$

* denotes differences that are significant at alpha=.05.